

II.4-RES-SNGL-A-MINQ SINGLE RESERVOIR REGULATION OPERATION SCHEME
MINIMIZE PEAK OUTFLOW FROM RESERVOIR

Description

Scheme MINQ determines a release to try to prevent flooding at a downstream location by using forecasted inflows.

When maximum flood damage occurs a short distance downstream from a dam the flood-control plan might attempt to minimize the peak outflow from the dam. This type of operation requires an accurate forecast of reservoir inflow over the period of time required to fill and empty the reservoir. For this Scheme computations must be made for the entire outflow hydrograph than one time period. Variations in the regulation Scheme will be required since it would not be desirable in most cases for the outflow to be suddenly increased in the manner that would provide the absolute minimum peak outflow. Variations in the Scheme would depend on such factors as the shape of the inflow hydrograph, the location of potential damage areas downstream from the dam and the time of travel to those areas.

This Scheme must be preceded by the execution of the Inflow Summation Utility to compute accumulated inflow values.

The following optional methods of increasing outflow can be used in this type of operation:

- o Increase outflow uniformly over a specified time period to the optimum constant peak discharge. The optimum constant peak outflow is determined by moving along the recession side of the flood hydrograph until the sum of inflows minus outflows equals the change in pool storage from the initial value to full pool. Since the pool might be drawn down at the beginning of the flood period a minimum pool elevation would be specified and checks on the elevation versus discharge curve would be made to see if the desired outflows could be passed.
- o Pass inflow until inflow equals the maximum constant peak discharge and then pass the constant peak discharge. The minimized constant peak discharge is determined as previously indicated.

In both of these options the peak discharge could be increased to flood discharge if it is less than flood discharge and if the peak inflow exceeds flood discharge. This would provide additional storage if a subsequent flood occurs before flood storage is evacuated. However some dam operators would prefer to use the computed peak outflow to conserve water for power or other purposes. An indicator variable is used to specify the desired operation for this situation.

The following options are available for evacuating flood storage:

- o The flood storage is evacuated by continuing the constant peak outflow until evacuation is near completion. Due to erosion

problems a transitional time period is specified for lowering the outflow to the inflow hydrograph at the time the pool is lowered to normal elevation.

- o After the inflow has receded to maximum outflow inflow is passed until inflow recedes to a specified lower limit for outflow (maximum generation flow for example). This limiting outflow is then passed until the pool is brought back to normal.

When there is an appreciable drainage area between the dam and the flood control point the combination of dam outflow routed to the control point and flow contribution from the area below the dam must be minimized. This situation will be addressed in the next phase of model development.

The Figure 1 shows the options for increasing outflow and Figure 2 shows the options evacuating flood storage.

Parameters

- (INCOPT) - Option for increasing outflow (can be 1 or 2)
- (HUPPER) - Limiting upper elevation
- (HLOWER) - Limiting lower elevation
- (TOL) - Convergence criterion

The curve of pool elevation versus maximum discharge is needed and can be entered by any of the following three methods (A, B, C):

Method A: Direct entry of curve

- (ELVSMAXQ) - Curve of pool elevations versus maximum discharges

Method B: Combination of elevation/discharge curve and constant non-spillway discharge

- (NORMQ) - Constant non-spillway maximum discharge
- (ELVSQ) - Elevation versus discharge (not max discharge) curve

Method C: Tailwater affects the non-spillway discharge

- (ELVSQ) - Elevation versus discharge
- (HEADVSQ) - Head versus non-spillway discharge curve
- (TWCURVE) - Tailwater Rating Curve
- (CONV) - Convergency criterion

Additional parameters:

- (REPL) - Peak replacing threshold
- (NPERR) - Number of blend period in rising limb of inflow hydrograph
- (INCQ) - Flag indicating an increase to flood discharge (yes or no)
- (FLOODQ) - Flood discharge - needed if INCQ is yes
- (EVOPT) - Evacuation option (1 or 2)
- (NPERF) - Number of periods for blending back into falling limb of inflow hydrograph
- (TARGETH) - Target drawdown elevation
- (CURVE) - Rulecurve - needed if TARGETH specifies a limit as the rulecurve elevation
- (RULETIME) - Time of day rulecurve is set
- (LOWERLIMQ) - Lower limiting discharge

Time Series

No time series are needed.

Carryover

No carryover is required.

Figure 1. Options for increasing outflow

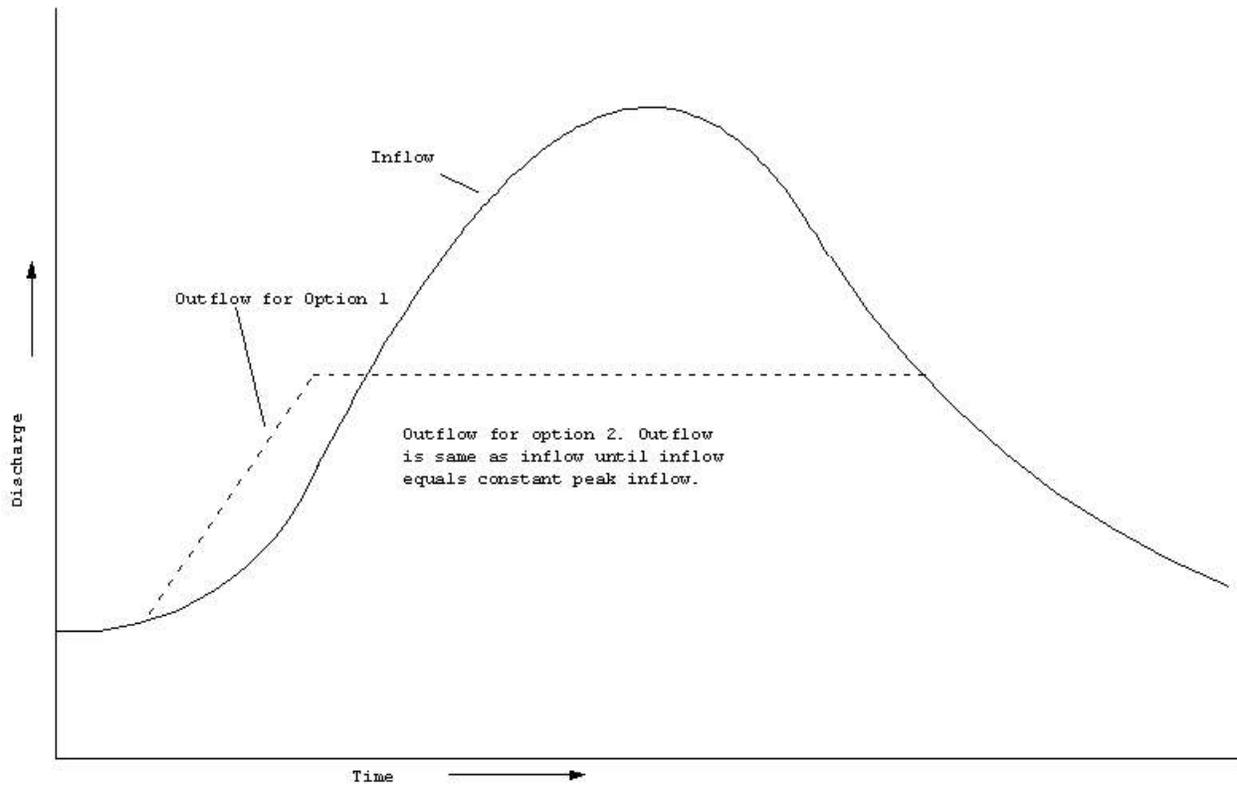


Figure 2. Options for evacuating flood storage

